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ABSTRACT

Covering the time period of January 1974 to June 1975, the report describes the activities of an ongoing project to provide verbal problem sets for occupational math courses offered in Oregon community colleges and secondary schools. The problems were selected to provide the math skills necessary for job entry and performance in several vocational-technical occupations. An individualized format permits students to work problems in various career areas and alleviates material duplication by individual instructors. An evaluation of a small subset of problem sets was carried out in 12 model secondary schools and seven community colleges. In addition to compiling, printing, and disseminating the problem sets, the project also developed a proceedings booklet illustrating some of the uses of the problem sets. The five-page booklet is appended to the report along with a 20-page report of a subproject that consisted of three State conferences for vo-tech instructors. Other project-related materials are included. (NJ)

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FINAL REPORT

THE OREGON VO-TECH MATH PROJECT

(Project No. EP9874)
(Grant No. 22-650-060)
(Grant No. 22-650-074)

BEST COPY AVAILABLE

Project Director
Dell L. Swearingen

Linn-Benton Community College

Albany, Oregon

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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June 13, 1975

CE 005 877

(VT-102-378)

STATE DEPARTMENT OF EDUCATION

COMMUNITY COLLEGES AND CAREER EDUCATION

EXEMPLARY

TITLE: The Oregon Vo-Tech Math Project

INSTITUTION: Linn-Benton Community College

PROJECT DIRECTOR: Dell L. Swearingen, Math Instructor
Address: 6500 S.W. Pacific Blvd
Linn-Benton Community College
Albany, Oregon 97321
Phone: 928-2361, extension 304

PROJECT DURATION PHASE I: January 1, 1974 through June 30, 1974

PROJECT DURATION PHASE II: July 1, 1974 through June 30, 1975

COSTS:	Federal	Local (in kind)	Other	Total
	$20,000	$2,800	$16,157.73	$38,957.73

PROJECT DESCRIPTION:

The on-going Oregon Vo-Tech Math Project is designed to provide resources in the form of verbal problem sets for occupational math courses offered in Oregon community colleges and secondary schools.

PURPOSE:

Prior to the beginning of Phase I of the project we had produced rough draft problem sets in each of the following areas: Electronics, Diesel Mechanics, Forestry, Auto Mechanics, Industrial Electrical, Aviation Mechanics, Welding, Real Estate, Agriculture, Wastewater Technology, Construction, Police and Fire Science, Wood Products, Industrial Mechanics, Nursing, Machine Tools, Drafting, Clerical, Forest Products, Food Processing and Marketing.

These problem set booklets were not in a practical format from a student or instructor's viewpoint. We adopted a new format and printed an evaluation set which concentrated on a small subset of Vo-Tech Problem sets. The new format allowed students to work problems in various career areas and alleviated material duplication by individual instructors.

The evaluation data gathered in twelve high schools and seven community colleges was used as a basis of converting nine of the complete problem set booklets to final form.

The major purpose of Phase II of the on-going Oregon Vo-Tech Math Project was to put the remaining problem sets in print-ready form, print and disseminate the problem sets. We also hoped to: 1) investigate strategies for using the problem sets in the classroom, 2) strengthen lines of communication among groups associated with vo-tech students and 3) conduct a third party evaluation of the project.

PROCEDURES AND OUTCOMES:

The steering committee of the Oregon Vo-Tech Math Project selected a review board of two students and two math instructors who converted the complete set of twenty-two verbal problem booklets to a new format. Then three secretaries provided the human resources to put the problem sets in print-

ready form. Finally, a local printer printed the problem set booklets.

Using funding from the Oregon Math Education Council provided through a systems grant from N.S.F. a subproject evolved which investigated potential hands-on activities and instructional strategies to be used in conjunction with the problem sets. This subproject involved fourteen community college and high school math instructors from various areas of the state.

The project director was able to promote articulation of math curriculums throughout the state. Some of the highlights included talks to: 1) regional O.C.T.M. conferences, 2) the community college math chairmen, 3) the math science faculty at Oregon College of Education, 4) the math education faculty at the University of Oregon, 5) Learning Skills Statewide Conference at Chemeketa Community College and 6) the career specialist under the direction of Sid Thompson.

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A. PROJECT BACKGROUND

Students who continue their education in terminal career occupational programs at Oregon community colleges make up more than half of the total Oregon high school enrollment. To provide these students, many of whom have severe learning handicaps, with mathematics skills they "need" and to allow for flexibility in mathematics programs, resources must be made available to high school and community college instructors to make mathematics relevant to Vo-Tech occcupations.

The Oregon Vo-Tech Math Project is designed to provide practical resources in the form of verbal problem sets for occupational math courses offered in Oregon community colleges and secondary schools. The math problems were identified by observation and discussion with technicians involved in specific career activities. The problems selected were aimed at: 1) providing the math skills necessary for an individual to get a job and perform that job adequately, and 2) providing an individual with the math skills necessary for advancement. When these skills were adequately defined, the information became valuable in determining course content needed to meet new high school graduation requirements. The problem sets provided a primary resource for planning occupational math curriculum and determining related behavioral objectives. They were designed to create a learning climate which would be supportive to and provide positive reinforcement of math concepts with relevancy to specific occupational areas.

At the beginning of this exemplary project the verbal problems were contained in rough draft booklets according to career cluster areas. These booklets were not in a practical form from a student or instructor's point of view. We needed to adopt an individualized format and print

the problem sets accordingly. Such a format permitted students to work problems in various career areas and alleviate material duplication by individual instructors.

Using monies from last year's exemplary funds, we evaluated a small subset of our problem sets which were individualized by math topic. We conducted this evaluation in twelve model secondary schools and seven Oregon community colleges. A model math articulation program was also started. Efforts were made to encourage articulation between:

a) secondary schools, community colleges, and four-year schools
b) all community colleges in Oregon
c) math and vo-tech instructors
d) schools and the community they serve

The grant permitted us to convert all of the existing problem sets into the new individualized format and print them. The problem sets were then made available for dissemination. Orders for the materials were filled through Continuing Education Publication.

The model secondary schools and community colleges continued to serve as evaluation sites for the complete problem sets as they were printed. Schools wishing to observe various delivery systems in action were directed to the appropriate model school in their geographical area.

Presently many students have a three to four year void in math due to the state requirement of only one year of math during high school. With the practical problems available, these students will continue using mathematics during vocational education. This approach to mathematics allows the students to actually see math problems which they will encounter on the job in various career fields.

EDUCATIONAL SETTING

The complete set of Vo-Tech Math problem sets include booklets in each of the following occupational areas: Electronics, Diesel Mechanics, Forestry, Auto Mechanics, Industrial Electrical, Aviation Mechanics, Welding, Real Estate, Agriculture, Wastewater Technology, Construction, Police-Fire Science, Wood Products, Industrial Mechanics, Nursing, Machine Tools, Drafting, Clerical, Forest Products, Food Processing, Marketing and Dental Assistant. The math topics included in the booklets vary somewhat. However, the greatest variance in math topics is between the vocational booklets and the technical booklets. Many of the vocational booklets can be utilized with a solid arithmetic and a limited algebra and geometry background whereas, most of the technical areas require a solid background in each of the following areas: arithmetic, algebra, geometry and trigonometry. The complete set of Oregon Vo-Tech Math Project booklets include the following set of math topics: Percent, Graphs and Tables, Simple Equations, Integers, Ratio and Proportions, Calculus and Statistics, Trigonometry, Algebra, Square Root, Volume, Area, Fractions, Geometry, Measurement and Conversion, Whole Numbers, Logarithms, and Decimals.

Each Vo-Tech problem booklet includes problems with complete solutions and problems with separate solutions.

The project director would like to emphasize that while these problem sets provide a vo-tech math instructor with a very valuable resource they are not a panacea or catholicon to solve all problems which arise in vo-tech or general math classes. Problems selected for student use should be chosen with care by a good classroom instructor. The above comment is necessary in that the problem sets

were originally written for community college math students in a vo-tech math class and are now being used at many levels. Thus, instructors who expect to hand students complete booklets while providing a minimum amount of guidance will probably be very disappointed with these materials.

An interested instructor can find the booklets being used at many schools in Oregon. Some examples of different uses of the problem sets can be observed at the following community colleges: Treasure Valley Community College, Blue Mountain Community College, Clackamas Community College, Mount Hood Community College, Chemeketa Community College and Linn-Benton Community College. Of course, the booklets are used in many high schools as well.

PERSONNEL

STEERING COMMITTEE

Oregon Vo-Tech Math Project Steering Committee:

Chairman:	Dell Swearingen, Linn-Benton Community College
Members:	Dr. Bill Simons, Oregon State University
	Dr. Bob Main, Oregon College of Education
	Harold Hauser, Blue Mountain Community College
	Frank Weeks, Mount Hood Community College
	Mike Morgan, Linn-Benton Community College
	Gene Enfield, Sprague High School
	Dennis Dedrick, Medford Mid-High School
	Dick Holiday, Rogue Community College

ASSESSMENT TEAM

Burr Fancher will serve both as third party evaluator and chairman of the assessment team. The other two members of the assessment team are:

Dr. Peter C. Scott, Linn-Benton Community College

Mr. C. Y. Arnold, Philomath High School

PROJECT STAFF

The Project Staff consisted of Linn-Benton Community College students. Without the dedication of these students, the project would not have been completed on time.

Graphic Artist:	Rose Davis
Editor:	Norma Cosler
Assistant Editors:	Bob Mack Mike Long
Typists:	Tina Hale Shelley Mack

The booklet covers were designed by Priscilla Harden of the Linn-Benton Community College graphics staff. Many mathematics instructors from around the state helped convert the rough draft problem sets to their present format. Without their help the project could never have been completed. Since their names appear on the problem set booklets the project director will omit their names at this point. Harold Hauser of Blue Mountain Community College was responsible for the final proof reading of the twenty-two booklets. The project director is indebted to Harold for the many hours he spent on this timely task.

REVIEW OF GOALS AND OBJECTIVES

GOALS	OBJECTIVES	
1 To print and disseminate existing problem sets produced by the Oregon Vo-Tech Math Project in a format which will facilitate their use in the classroom.	1.1 Adopt an individualized format and convert the rough draft problem sets in a specific career cluster areas to this new format.	1.11 Sche Vo-T comm 1974 form
		1.12 The inat stud revi this stee Jan.
		1.13 This of a typi draf adop
		1.14 Usin duri the to i rela care
	1.2 Print all existing career area math problem sets.	1.21 Once ized will form
		1.22 A pri July
		1.23 The p print
	1.3 Disseminate existing career area math problem sets.	1.31 The m throu in ac 1974.

	OBJECTIVES	ACTIVITIES
xisting he Oregon format r use in	1.1 Adopt an individualized format and convert the rough draft problem sets in a specific career cluster areas to this new format.	1.11 Schedule a meeting of the Oregon Vo-Tech Math Project steering committee to be held Jan. 26, 1974 to adopt an individualized format.
		1.12 The project director will nominate two participants and two students to serve as members of a review board. The members of this review board are subject to steering committee approval on Jan. 26, 1974.
		1.13 This review board with the help of a graphic artist and three typists will convert the rough draft problem sets to the adopted format by Aug. 1, 1974.
		1.14 Using the materials gathered during the previous summers, the review board will continue to identify general objectives related to specific occupational career areas.
	1.2 Print all existing career area math problem sets.	1.21 Once converted to the individualized format the problem sets will be typed in print-ready form by Aug. 10, 1974.
		1.22 A printer will be contracted by July 15, 1974.
		1.23 The problem sets will be printed by Sept. 10, 1974.
	1.3 Disseminate existing career area math problem sets.	1.31 The material will be available through the printer (mentioned in activity 1.22) by Sept. 15, 1974.

GOALS	OBJECTIVES	
		1.32 Loca coll stat obta 1974
		1.33 The of t loca be i
		1.34 The thro prin in o Depa will to o sets
2 Incorporate various delivery systems for math education in Oregon schools.	2.1 Inform secondary and community college instructors about various strategies for using the Vo-Tech Math materials.	2.11 At t Janu vary desc syst mate
		2.12 Scho mate dire mode and
3 Promote articulation between educational institutions, Oregon State Board and community colleges, industry, and the community.	3.1 Strengthen lines of articulation between: a. secondary schools, community colleges, and four-year schools b. math and Vo-Tech instructors c. schools and the community they serve d. community colleges and the State Dept. of Education	3.11 Re-o to p repr comm year

OBJECTIVES		ACTIVITIES
		1.32 Local I.E.D.'s and community colleges will receive a letter stating both where and how to obtain the material by Sept. 5, 1974.
		1.33 The feasibility of distribution of the problem sets through local I.E.D.'s and D.C.E. will be investigated by Oct. 1, 1974.
		1.34 The problem sets will be available through D.C.E. or some other printing and disseminating source in conjunction with the State Department of Education. This will allow all interested schools to obtain copies of the problem sets.
y systems n schools.	2.1 Inform secondary and community college instructors about various strategies for using the Vo-Tech Math materials.	2.11 At the orientation meeting on January 26, 1974 four schools of varying size and composition will describe their ongoing delivery systems using the Vo-Tech Math materials.
		2.12 Schools inquiring about the materials and their use will be directed to the participating model schools and the instructor and administrator in charge.
n regon olleges, .	3.1 Strengthen lines of articulation between: a. secondary schools, community colleges, and four-year schools b. math and Vo-Tech instructors c. schools and the community they serve d. community colleges and the State Dept. of Education	3.11 Re-organize the steering committee to provide a better cross section representation of high schools, community colleges, and four-year schools.

GOALS	OBJECTIVES	
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		3.13 The sen pro qua mat mee
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4 To evaluate the Oregon Vo-Tech Math Project.	4.1 Conduct an evaluation of the Oregon Vo-Tech Math Project.	4.11 Bur the the
		4.12 Mr. pro obj

OBJECTIVES		ACTIVITIES
		3.12 The State Dept. of Education specialist will be kept up to date on the status of the project.
		3.13 The project director or representative will report on the project's activities at each quarterly community college math department chairmen meetings.
		3.14 The project director will send minutes of the steering committee meetings to previous project participants.
		3.15 Project participants will develop a response to present at two O.C.T.M. conferences on Oregon.
		3.16 Establish model schools to be used as demonstration sites. Through the use of the model schools articulation will occur between all elements listed in Objective 3.1.
		3.17 The no-host conference mentioned above will be arranged to promote articulation between the educational elements of the project.
o-Tech Math	4.1 Conduct an evaluation of the Oregon Vo-Tech Math Project.	4.11 Burr Fancher has agreed to be the third party evaluator of the project.
		4.12 Mr. Fancher will evaluate the project in terms of its stated objectives by July 1, 1975.

GOALS	OBJECTIVES
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OBJECTIVES	ACTIVITIES
	4.13 An assessment team will provide an on-going evaluation of the project as it progresses.
	4.14 At the January 9th meeting the project director will request that a subcommittee of the local apprentice board evaluate selected problem sets of the project.

B. MAJOR ACCOMPLISHMENTS OR OUTCOMES

DESCRIPTION OF PROCEDURES

1. Developmental Phase December 1973- June 1974

The developmental phase consisted of the following activities:

a. A third party evaluator was choosen by January 9, 1974.

Third party evaluation of the project was conducted by a three member assessment team headed by Burr Fancher, Director of Linn-Benton I.E.D., and by model schools using the materials produced by the project.

b. The Oregon Vo-Tech Math Project steering committee was reorganized by January 26, 1974, to provide a better cross-section of Oregon's schools. This reorganization was conducted by the project director and the previous steering committee. The reorganized steering committee was responsible for a) selection of a project assessment team, b) selection of a review board and c) adoption of an individualized format for the problem sets.

c. Contacting model high schools and community colleges concerning evaluation of project materials.

A small subset of Vo-Tech Math Project materials were evaluated in model high schools and community colleges during Winter and Spring terms, 1974. Inquiries about the use of the project materials were directed to the model schools.

2. Revision and Printing June 1974 - Sept. 1, 1974

This phase of the project consisted of the following activities:

a. Revision of existing Vo-Tech Math Project problem sets.

Each of the existing problem sets were revised into an individualized format as adopted by the project steering committee.

This revision was performed by the review board with the advice and assistance of a graphic artist. The review board met at LBCC during the week of June 10-14, 1974. The week was devoted to orientation and revision of as much material as time allowed.

This revised material was submitted to the secretaries for print-ready typing. The remaining problem sets in need of revision were divided among project participants and were returned for typing as each set was revised. All problem sets were revised and typed in print-ready form by August 10, 1974.

b. Printing of Vo-Tech Math Project problem sets.

By July 15, 1974 a printer was contracted. The individualized problem sets were printed by September 10, 1974.

c. Evaluation of Project activities to date.

The assessment team identified in Activity 1 of the developmental phase, met with the project director prior to printing of materials to decide whether to continue, modify, or terminate the project.

DISSEMINATION AND EVALUATION OF RESULTS

This phase of the project consisted of the following activities:

1. Dissemination of individualized problem sets.

Dissemination of printed problem sets was a two-fold process. Copies of the problem sets were placed in participating schools for evaluation. The remaining copies were made available for dissemination through Continuing Education Publications.

The feasibility of such dissemination was investigated by mid-

Sept., 1974 in order to help insure their use in the classroom. The problem sets were ready for dissemination by Sept. 10, 1974.

2. Evaluation of individualized problem sets.

   The individualized problem sets were distributed to the participating schools. An evaluation instrument was developed with the assistance of Burr Fancher and distributed with some of the problem sets. Copies of selected problem sets were submitted to a subcommittee of a local apprentice board for critiquing and evaluation. Burr Fancher gave some copies of the booklets to industry friends for their input.

3. Overall evaluation of the Oregon Vo-Tech Math Project.

   The overall project will be evaluated by Burr Fancher. The overall project will be evaluated on the following criteria: a) meeting of stated objectives, b) development of effective dissemination channels and c) promotion of articulation between the various groups indicated in Objective 2.

STAFF DEVELOPMENT & INSTRUCTIONAL PROGRAM

Staff development was not included in this proposal, but because articulation was an objective the project director will briefly report on another project under his direction by the same title which dovetails into this project. The project was funded through a systems grant by the National Science Foundation to the Oregon Mathematics Education Council (OMEC). The six week conference consisted of three meetings which were located as follows: a three day meeting at the Inn of the Seventh Mountain in Bend, Oregon, one day meeting at Linn-Benton Community College and a two day meeting at the Inn at Otter Crest near Newport, Oregon.

The initial meeting included orientation and articulation on each of the following topics:

a. history of the Oregon Vo-Tech Math Project.

b. availability of some of the Oregon Vo-Tech Math Project problem sets and potential uses.

c. summary of other projects and resources throughout the United States.

d. the presentation of possible instructional strategies.

e. demonstration of hands-on activities developed for student use.

f. outlines of potential Vo-Tech math courses for high school students.

The participants chose from the above list areas they wanted to investigate in greater detail.

The mid-summer meeting at Linn-Benton Community College furthered articulation since the project director and group leader were able to help participants with difficulties they had encountered.

The final session at the Inn at Otter Crest consisted of a sharing of each participants summer work. Many excellent teaching ideas surfaced at this meeting.

In addition, a follow up meeting was held at Linn-Benton Community College on February 22, 1975. An interested reader will find a more detailed account of the above mentioned project in the Appendix of this report.

MATERIALS AND CONTENT DEVELOPED

The complete set of Oregon Vo-Tech Math Project rough draft problem sets were converted to the finalized format as indicated in the June 30, 1974 (Phase I) Final Report. Once the problem sets were in print-ready

form (August 10, 1974) they were printed and then collated both by math topic and by occupational area. Ordering information and a complete list of topics available is given below.

OCCUPATIONAL AREAS

1) Electronics
2) Diesel Mechanics
3) Forestry
4) Auto Mechanics
5) Industrial Electrical
6) Aviation Mechanics
7) Welding
8) Real Estate
9) Wastewater Technology
10) Agriculture
11) Construction
12) Police-Fire Science
13) Wood Products
14) Industrial Mechanics
15) Nursing
16) Machine Tools
17) Drafting
18) Clerical
19) Forest Products
20) Food Processing
21) Marketing
22) Dental Assistant

MATH TOPICS

1) Percent
2) Graphs and Tables
3) Simple Equations
4) Integers
5) Ratio and Proportion
6) Calculus and Statistics
7) Trigonometry
8) Algebra
9) Square Root
10) Volume
11) Area
12) Fractions
13) Geometry
14) Measurement and Conversion
15) Whole Numbers
16) Logarithms
17) Decimals

These problem sets may be obtained for a nominal cost from the following address:

Continuing Education Publications
1633 S.W. Park Avenue
P.O. Box 1491
Portland, Oregon 97208 Telephone: (503) 229-4843

The dissemination of complementary copies of the problem sets was a massive task. The career section of the Oregon Department of Education suggested that we give problem sets to each of the schools which have been involved in the project. The total number of problem sets given away for introductory purposes consists of 65 sets by occupational area and 66 sets by math topic. The remaining problem sets were turned over to Continuing Education Publications for marketing which helped recover

a deficit accrued through the high cost of printing the materials at a local printer.

In addition, a Proceedings Booklet was developed that illustrated some of the uses of Vo-Tech Math Project booklets.

OTHER

The project director and Dr. Bob Main, Department Coordinator of the Oregon College of Education Math Department, developed a slide presentation which explains some of the accomplishments of the Oregon Vo-Tech Math Project to date. The project director facilitated articulation and explained the project to each of the following groups:

1) a potential graduate class at O.C.E.
2) Burr Fancher's - Career Ed Cadre class at O.S.U.
3) O.C.T.M. meeting in Florence
4) O.C.T.M. meeting in Klamath Falls
5) O.C.T.M.'s executive committee
6) the community college math department chairmen
7) O.C.T.M. Newsletter - math instructors throughout Oregon
8) the summer participants in the projects funded by O.M.E.C.
9) math education faculty at the University of Oregon
10) the math-science faculty at Oregon College of Education
11) representatives of high schools wanting to set up vo-tech math classes at their schools
12) Learning Skills Statewide Conference held at Chemeketa Community College
13) career specialist under the direction of Sid Thompson.

C. EVALUATION

DIRECTOR EVALUATION

After a lengthy discussion with the steering committee of the Oregon Vo-Tech Math Project, it was decided that outside evaluation should not focus entirely on students at the model schools filling out evaluation forms. They had already voiced their positive approval during the evaluation conducted during Spring term of 1974. Upon taking this information to an evaluation specialist in teaching research at Oregon College of Education, I found agreement with the steering committee. The evaluation specialist suggested the next developmental stage of the project should again include an instructor observing a review board of students working problems and rewriting any of the problems the students found confusing. After much discussing with Jim Hargis, Curriculum Coordinator at Oregon Department of Education, he agreed that no formal student evaluation was necessary until we could provide a student review board during the summer of 1975. Thus, the feed back from the model schools was for the most part very informal.

The project director with the help of an evaluation specialist developed an evaluation instrument. This instrument was again used on an informal basis to obtain instructors comments about the problem sets and suggestions for improvement.

To date, suggestions from students, instructors, evaluation specialist and curriculum specialist for improving the Oregon Vo-Tech Math problem sets may be summarized as follows:

Include

1) table of contents
2) definitions of unfamiliar terms
3) glossary of terms
4) more problems in some areas

In addition to the aforementioned improvements, the Oregon Department of Education program specialists also recommended the following:

1) Include more charts and tables which are used in industry.

2) Include problem leveling, (i.e.), divide the problems into two groups: a) problems which are needed to obtain and perform the job adequately, and b) problems needed for advancement.

3) Each booklet should include approximately the same number of problems. This is a consideration at the high school level since students like to feel that homework is distributed equally.

4) Vo-Tech instructors should be involved in the next developmental stage to help with defining terms, establishing the level of given problems, checking the relevancy of the problems, and improving the readablilty of the problem sets.

5) Develop a syllabus indicating very briefly how the problem sets can be used effectively in the classroom.

The project evaluator, Burr Fancher, has generously offered to distribute problem sets to some of his friends in business and industry. Their suggestions will be greatly appreciated.

LBIED

LINN - BENTON INTERMEDIATE EDUCATION DISTRICT

July 3, 1975

MEMO TO: Dell Swearingen, Project Director
Oregon Vo-Tech Math Project
Linn-Benton Community College

FROM: Burr Fancher
Regional Coordinator for Career Education
Linn-Benton I. E. D.

SUBJECT: Evaluation Summary

As third party evaluator of the Oregon Vo-Tech Math Project, I wish to comment on this effort and its value to relevance in education.

All objectives of this project proposal have been fully met and within the time frame of the original plan. Dell Swearingen is to be commended for his commitment to this project. He is quite dedicated to articulation between various levels of education and has devoted considerable time to explaining the problem sets to various groups of educators.

Some general evaluative statements are:

1) This project represents a bold step toward solving a well-recognized need in mathematics and career education programs.

2) The problem sets are well done and reflect a sound mathematical expertise in their development. Breakdown by mathematical and occupational areas makes them adaptable in either mathematics or occupational classes.

3) The format for the problem sets affords flexibility in usage.

4) This project has resulted in improved attitudes of mathematics instructors toward vo-tech math.

P.O. Box 967 · Albany, Oregon 97321 · Phone (503) 926-8621

5) Printing and dissemination of problems sets have been identified to make them easily available to instructors.

Some considerations for future efforts of this nature or continuation of this project might be:

1) Consider the academically disadvantaged student when developing sets, so that the level of difficulty is within their grasp.

2) Consider more extensive use of industry people to assure relevance of problem sets. (Make sure problems reflect actual needs of industry rather than what instructors perceive those needs to be.)

3) Develop a system of staff development for instructors that will assure wide range use of the problem sets.

In summary, I believe this project was needed as a first step for mathematics to bridge the gap between theoretical and actual. The project has been conducted in a highly professional manner that has met all timelines on schedule. The project objectives were accomplished and satisfactory procedures were developed for dissemination of the problem sets. I would like to encourage the State Department of Education to take further steps in the direction initiated by this project. As project evaluator, I feel very positive about the intent, procedure, and results of the Vo-Tech Math Project.

D. SUMMARY AND CONCLUSIONS

SUMMARY

The on-going Oregon Vo-Tech Math Project converted their materials to a format which will facilitate the use of the problem sets in the classroom. These problem sets consisting of 22 booklets by occupational area and 17 booklets by math topic were printed and disseminated to participating schools.

Using monies supplied by O.M.E.C. from N.S.F. we directed a summer project which investigated various activities and delivery systems for the use of the Vo-Tech Math Project problem sets. This project provided the participant and his(her) school the opportunity to improve mathematics instruction for the vo-tech student.

Through both projects, discussion with curriculum specialists, members of the local apprentice board, and communicating with groups from various levels of education the project director was able to promote articulation between each of the following groups: high schools, the State Department of Education, community colleges, representatives from four-year colleges and industry.

CONCLUSIONS

1. The problem sets still enjoy many positive reactions from students and instructors at the junior, senior high school level and at the community colleges. Only in a few cases have the problem sets been used successfully at the freshman and sophomore level at the high schools.
2. The classroom instructor must carefully plan the use of the problem sets. Any instructional material may fail when it is not used properly. These problem sets should not be given to students to work through a complete booklet on their own.

E. BUDGET

TITLE OF PROJECT Proposal DeVelopment for Exemplary Project

	LOCAL	FEDERAL
A. Personnel		
1) Staff--List Names W.A. Hulshof, Robert Mack, Shelly Mack, Pricilla Hardin, Mike Long, Del Swearingen, Rose Davis, Tina Hale		$ 1,229.24
2) Consultants--List Names		
Bob Finnell		123.41
Harold Hauser		
Gene Enfield		
Frank Weeks		
Sub-total		1,352.65
B. Travel		319.89
C. Services--Please Specify		
Printing		2,948.37
D. Supplies		136.18
E. Equipment		
F. Other Costs		
Phone		79.14
G. Fixed Costs		186.77
Cost Sharing (per cent)		
TOTAL COSTS		$ 5,023.00

TITLE OF PROJECT The Oregon Vo-Tech Math Project (Estimate)

	LOCAL	FEDERAL
a. Personnel		
1) Staff--List Names Del Swearingen, Robert Mack, Shelly Mack, Pricilla Harden, Mike Long, Norma Cosler, Tina Hale		$ 4,349.49
2) Consultants--List Names		
Bob Finnell		2,395.78
Harold Hauser		
Gene Enfield		
Frank Weeks		
Richard Dow		
Robert Goss		
Robert Larson		
Lon Kongslie		
Linda Cooper		
Mary Jane Simpson Sub-total		6,745.27
b. Travel		305.74
c. Services--Please Specify		
d. Supplies		6,632.73
e. Equipment		
f. Other Costs Phone		170.00
g. Fixed Costs		1,131.61
Cost Sharing (per cent)		
TOTAL COSTS		$14,985.35

F. RECOMMENDATIONS

1. Four-year schools need to offer inservice and preservice courses which include special training to those math instructors that teach the Vo-Tech students.
2. Students using the vo-tech math problem sets should have easy access to calculators.
3. Vo-Tech Math problem sets need to be developed for other career cluster areas. Instructors comment that they need problem sets in more areas which have traditionally interested girls.
4. Future writing teams, such as the welding instructors writing packets this past summer, should have a math and communication skills instructor working with them.
5. Future math instructors should have some knowledge about careers and what type of mathematics to expect in various occupations.
6. The Vo-Tech Math problem sets need to be converted into the metric system sometime in the very near future.
7. There is a definite need to keep the Vo-Tech Math problem booklets up-to-date and the responsibility lies with all math instructors.
8. The project director feels the project was again a success. We completed each objective and were able to adhere to the original time line in converting each of the problem sets booklets into print-ready form. In addition we had thirteen math instructors working on activities and instructional strategies for the classroom from June 20 - August 3, 1974. We also encouraged five high school math instructors to develop vo-tech math courses for their high schools.

APPENDIX

During the summer of 1974, participants in the Oregon Vo-Tech Math Project contributed material for the Oregon Vo-Tech Math Project Activities Catalogue. The Career Education Dissemination Specialist has a copy of this catalogue in the Dissemination Center for anyone interested in looking at it.

The budget for Proposal Development for Exemplary Project consisting of $5,023 was a carry over of funds from the previous years budget.

APPENDIX A

Letters of Interest

July 15, 1974

Dear Mr. Swearingen:

David Douglas High School's Mathematics Dept. is planning to arrange the vocational mathematics courses to aid each of the vocational areas taught at this school. Will you please send to our department one math packet for each of the following areas: wood products, marketing, agriculture, mechanics, machine tool technology, food processing, nursing and dental assisting, welding, building construction, industrial mechanics, industrial electrical and hydraulics, automotive technology, electronics, and drafting.

While attending a math conference in southern Oregon, I learned of your vocational packets. These will aid us in planning for each vocation.

Thank you and have a good summer.

Sincerely,

David L. Barger

David Barger
David Douglas High School
1500 S.E. 130th
Portland, Oregon 97233

CLEMSON UNIVERSITY
CLEMSON, SOUTH CAROLINA 29631

COLLEGE OF ENGINEERING
DEPARTMENT OF
ENVIRONMENTAL SYSTEMS ENGINEERING

TELEPHONE
803/656-3276

13 June 1975

Peter C. Scott, Director
Science Technology Division
Linn-Benton Community College
6500 SW Pacific Blvd.
Albany, OR 97321

Dear Peter:

The *Individualized Math Problems in Wastewater Tech* looks great. You have done an excellent job in amplifying our system.

Fred Delvecchio wants to come by and visit you. He will contact you prior to his visit.

Sincerely,

JOHN H. AUSTIN
Professor and Head
Environmental Systems Engineering

JHA/mns

Jackson County Intermediate Education District

101 North Grape Street - Medford, Oregon 97501
Telephone: 779-5510

Walter A. Commons
District Superintendent
Executive Secretary to the Board

August 28, 1974

Mr. Dell Swearingen
Linn-Benton Community College
6500 S. W. Pacific Blvd.
Albany, Oregon 97321

Dear Mr. Swearingen:

In recent dialogue with Dennis Dedrick, of Mid High School in Medford, I was seeking some direction in mathmatics instruction for our "Alternative Education" program at the Jackson County Intermediate Education Office. As our requirements, goals and ultimate competencies must be the same as Medford Mid High, Dennis suggested that we examine the Vo-Tech math materials that your committee formulated this summer.

I would appreciate your kind response to a request for a copy of your new materials as the beginning of our program is approaching quite rapidly.

Dennis suggested we request the following:

1. Resume of Vo-Tech materials each instructor developed this summer (1974). Of particular interest is Lynn Mitchel's materials on unit pricing and auto insurance.
2. Copy of Vo-Tech math project materials representing all 21 occupations.

If there are any fees charged in the distribution of your materials, please let me know.

Thanks for your time and consideration.

Sincerely,

Daniel A. Buck

Daniel A. Buck
Behavior Intervention Counselor

DAB:fr

WICHITA PUBLIC SCHOOLS
EDUCATIONAL SERVICES BUILDING
640 North Emporia
WICHITA, KANSAS 67214

Division of Curriculum Services
MURDOCK CENTER FOR INNOVATIVE
TEACHING EXPERIENCES

September 16, 1974

Mr. Dell Swearingen
Linn-Benton Community College
P.O. Box 249
Albany, Oregon 97321

Dear Mr. Swearingen:

Wichita is establishing a Center for Innovative Teaching Experiences. The Center will house an extensive library of teaching strategies and materials, as well as a work-room where teachers may prepare materials. Principal emphasis at this time is on the Junior Hign School level, however we are interested in all levels.

Mr. Eugene Maier, System Director, OMEC, has informed me that you may have some materials available at this time which would be useful to us.

If you could send materials and information available at the earliest date, we would be most thankful. If a cost is involved it will be necessary to forward a price list so that we may prepare a purchase order prior to ordering the materials.

Should you desire, your name will also be placed on a mailing list so that you might receive any new information on materials we prepare.

Mail to: Tom Martin, Project Teacher
Murdock Cite
670 North Edgemoor
Wichita, Kansas 67208

Sincerely yours,

Tom Martin

Tom Martin

TM:trb

Lane Intermediate Education District

AN EDUCATION SERVICE CENTER
748 PEARL STREET • EUGENE, OREGON 97401
Phone (503) 342-5576

DR. WILLIAM C. JONES
SUPERINTENDENT-CLERK

September 26, 1974

Dell L. Swearingen
Linn-Benton Community College
6500 S.W. Pacific Blvd.
Albany, Oregon

Dear Mr. Swearingen:

In a recent publication of the Oregon Council of Teachers of Mathematics you are listed as a speaker on the subject "Mathematics as related to Vocational Education" Oregon Vo-Tech. Math Project.

We are constantly searching for ways to draw out career implications in the curriculum, and your presentation appears to have career potential.

If it would be possible for you to send us a copy of your talk or copies of some of the materials you will be using, we would like very much to share your insights and discoveries with other teachers and administrators who are looking for ways to reinforce the total curriculum with career concepts.

We appreciate your help.

Sincerely,

Marilyn Olson

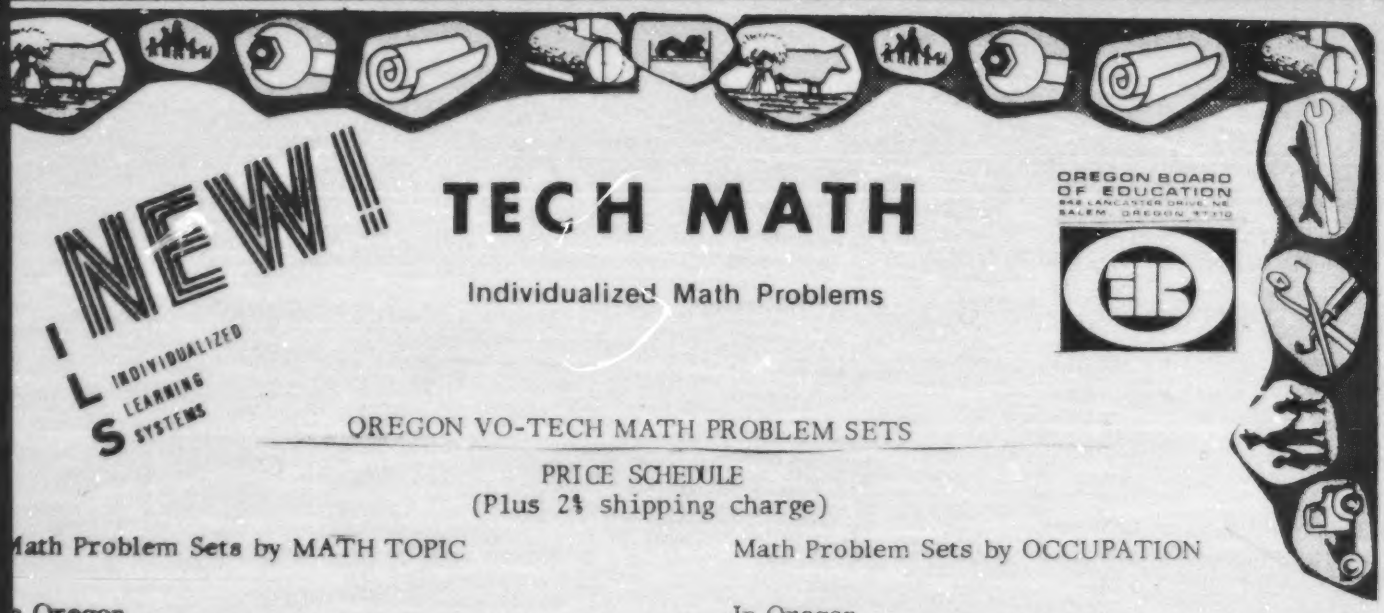
Marilyn Olson, Specialist
Career Education

MO:ms

BOARD OF EDUCATION: HUGH PENISTON - Chairman, Cottage Grove • LELAND HUFF - Vice-Chairman, Junction City • JEANNE ARMSTRONG, Springfield • JOYCE BENJAMIN, Cheshire • CYNTHIA WOOTEN, Eugene • HOWARD BIRD, Cottage Grove • NILE WILLIAMS, Veneta

APPENDIX B

Order Form



NEW!

ILS INDIVIDUALIZED LEARNING SYSTEMS

TECH MATH

Individualized Math Problems

OREGON BOARD OF EDUCATION
942 LANCASTER DRIVE NE
SALEM, OREGON 97310

OREGON VO-TECH MATH PROBLEM SETS

PRICE SCHEDULE
(Plus 2% shipping charge)

Math Problem Sets by MATH TOPIC

In Oregon
SET - $25.50 PER PACKAGE - $1.60 ($1.50 in quantities of five or more of any package or combination

Outside of Oregon
SET - $27.50 PER PACKAGE - $1.75 ($1.65 in quantity)

Math Problem Sets by OCCUPATION

In Oregon
SET - $33.60 PER PACKAGE - $1.75 ($1.60 in quantities of five or more of any package or combination.

Outside of Oregon
SET - $36.00 PER PACKAGE - $1.85 ($1.70 in quantity)

Order from: CONTINUING EDUCATION PUBLICATIONS
1633 S.W. Park Avenue
P.O. Box 1491 Telephone: (503)229-4843

Order Form

Oregon Vo-Tech Mathematics Problem Sets

by MATH TOPICS (17 packages) SET(S)__ by OCCUPATIONS (21 packages) SET(S)__

If you wish to order individual packages, please indicate quatities below.

__Percent
__Graphs and Tables
__Simple Equations
__Integers
__Ratios and Proportions
__Caluculus and Statistics
__Trigonometry
__Algebra
__Square Root
__Volume
__Area
__Fractions
__Geometry
__Measurement and Conversion
__Whole Numbers
__Logarithms
__Decimals

__Electronics
__Diesel Mechanics
__Forestry
__Auto Mechanics
__Industrial, Electrical, Hydraulics
__Aviation Mechanics
__Welding
__Real Estate
__Agriculture
__Wastewater Technology
__Construction
__Police-Fire Science
__Wood Products
__Industrial Mechanics
__Nursing
__Machine Tools
__Drafting

__Clerical
__Forest Products
__Food Processing
__Marketing

Use BankAmericard or Master Charge

My BankAmericard No._____

Master Charge No._____

Expires_____

Signature_____

NAME OF PERSON ORDERING_____

ADDRESS_____

APPENDIX C

Oregon Vo-Tech Math Sales

Oregon Division of Continuing Education

1633 S.W. Park Ave.
P.O. Box 1491
Portland, Oregon 97207
Tel. 503/229-4800

June 23, 1975

Vo-Tech Math Sales through June 20, 1975

Oregon School Districts

Salem *	25.50 occ	Columbia Cty.	9.79
Elgin	5.25 occ	Pleasant Hill	27.74
Douglas Cty.	152.00 occ	McMinnville	11.22
McKenzie	13.77	Medford	26.01 T
Lake Oswego	36.41	Ashland	60.28 T
Corvallis	21.42	Clatsop Cty. *	60.28 Occ & T
Eagle Point	60.28	Salem *	26.01 T
N. Clackamas	1.79	Beaverton	34.27 occ & T
Willamina	31.37	Fern Ridge *	34.27 occ
Newberg	34.17	Junction City	11.42
Lebanon	21.22	Tigard	34.27
Myrtle Point	5.36	Multnomah Cty. *	34.27
Douglas	34.27 occ	Clatsop Cty *	60.28
Eugene	60.28 occ & T	Multnomah Cty. *	29.38
Coos County	59.10		
Total	$1,024.68		

High Schools in Oregon

Dayton *	59.10 occ & T	J. Adams	60.28 occ & T
Dayton *	33.60 occ	Franklin *	219.34
Skyline	11.90	Grant Union	40.70
Burns	26.01	Jackson Hi Lebanon*	19.58
Pendleton	60.28	Fern Ridge Hi *	21.47
Rainier	33.60		
Crater	34.27		
Jackson Hi Lebanon*	34.22 occ		
Lakeridge	19.58		
Total	$673.93		

Community Colleges in Oregon

Ashland	33.60 occ
PCC *	20.32 occ
PCC *	44.45 occ
Coos Bay	1.60 T
Linn *	46.64
Blue Mountain	5.25
Central Oregon	26.01 T
Linn *	7.14
PCC *	19.58
Total	$204.59

The Division of Continuing Education serves the state of Oregon through facilities and resources of colleges and universities of the Oregon System of Higher Education, and in cooperation with other educational and state agencies. Divisional offices are located in Ashland, Astoria, Coos Bay, Corvallis, Eugene, La Grande, Portland, and Salem.

Other Oregon Users

1.75 occ
1.75 occ
3.50 occ
5.25
25.50

Total $ 34.25

Western States & Western Canada

19.50 occ & T
63.50 occ & T
170.00 occ
64.77
38.60
28.05 T
3.15 T

Total $387.57

Eastern States & Eastern Canada

36.00 occ
29.75 occ
36.72
63.70
36.70
6.70
67.77 occ & T
36.72 occ
3.50
27.50
194.31 occ & T

Total $539.37

Total Vo-Tech Math Sales through June 20, 1975 $2,864.39

* = multiple user
occ = Pamphlet sales by occupation
T = Pamphlet sales by Math Topic

APPENDIX D

Evaluation Sheet

1. Vo-Tech terms appear in many problem sets as they are used on the job. (Check as many as apply.)

- ☐ A. The terms should be defined as part of the problem.
- ☐ B. A glossary of terms should be included.
- ☐ C. Leave the Vo-Tech terms undefined.
- ☐ D. Other (comment)_____

YES NO

2. ☐ ☐ I found the Vo-Tech Math problem sets to be useful as a resource.

3. In attempting to use the materials (check as many as apply.)

- ☐ A. I found an overview of potential uses lacking.
- ☐ B. In using these materials an index would have been useful to me.
- ☐ C. A table of contents would be beneficial.
- ☐ D. A booklet of potential uses would be beneficial.
- ☐ E. The problem set would be enhanced by including more pictures.
- ☐ F. Other (comment)_____

4. Were there particular problems you noted which were not representative of the math used in your field? Please note problem numbers and page numbers.

_____

_____

5. Were there problems which students had particular difficulty with? Please note problems and page numbers.

_____

_____

6. How did you make use of this material? (Check as many as apply.)

- ☐ A. As a source of test questions.
- ☐ B. As a source of material for my own classroom material.
- ☐ C. As worksheets for the students.
- ☐ D. As a basis for my entire program.
- ☐ E. I did not use the material.
- ☐ F. Other _____

APPENDIX E

Oregon Vo-Tech Math Project's Proceeding Booklet

THE OREGON VO-TECH MATH PROJECT'S

PROCEEDING BOOKLET

BACKGROUND

The Oregon Vo-Tech Math Project has been an on-going attempt to make mathematics relevant to and meaningful for vocational and technical students. In this attempt, the project has taken several courses, the principle one being the gathering of a repertoire of realistic verbal problems relating to a number of occupations. These problems were identified through observations of and conversions with technicians involved in activities of their specific careers. The problems for each specific career area can generally be placed in two categories: those that involve mathematical skills necessary for adequate performance on the job and those that involve "nice to know" mathematical skills or skills necessary for promotion. It is hoped that these problem sets will provide a means of reinforcing mathematical skills. It is also hoped that they will enhance the transfer of these skills to on the job problem solving situations.

USE OF PROBLEM SETS

The Vo-Tech Math problem sets can be used in a wide variety of ways. It must be clear, however, that the problem sets do not serve as a text for teaching the mathematics skills necessary for problem solving. With this in mind, it is suggested that use of the problem sets be accompanied by the use of a text embodying these necessary mathematical skills. There are several such books on the market:

Core Mathematics; Bila, Bottorff, Merritt & Ross; February, 1975; Worth Publishers.

Core Mathematics for the Occupational Student; Morgan, Swearingen, Cook; January 1, 1976; Canfield Press.

Introduction to Technical Mathematics; 1969; Washington Cummings Publishing Company.

Mathematics for Technical and Vocational Students; 1968, Sixth Edition; Slade, Maroolis, Boyce;

The Vo-Tech problem sets have been collated two ways, by occupation and by math topic. This organization allows for a wider variety of usage. For example, a student may wish to work only on problems from a chosen occupation or he may wish to work a smattering of problems from several occupations. Collation by math topic allows the teacher to have students work problems that relate to the mathematical concept they are presently covering. Collation by occupation, gives the teacher and student a hint about the mathematical skills required to be successful in a particular occupation. Collation by occupation is also useful for the instructor who is teaching a math class for a particular occupation. The problem sets, collated in either fashion, provide a resource for the enrichment of a variety of math classes.

The most obvious use of these materials seems to be with a vocational or technical math class. A variety of uses is possible with this type of class. The problems could be used as homework -- this might prompt some parental involvement which in turn might cause some positive reinforcement. The problems could be used as required work after the completion of a particular mathematics topic in class. For example, after completing a unit on fractions, each student in a basic math class could be required to work the problems on fractions from one or more occupations of his choice. The problems could be used as a project requirement, with the completion of the project to come after the necessary mathematics skills have been developed. The problem sets can be used as a source of "problem of the week" problems. This use requires each student to submit one carefully solved problem, with its concisely written solution, per week. (This use has proven itself successful with technical math students at Linn-Benton and Mount Hood Community Colleges.) Use of the problem sets need not be restricted to vocational and technical math courses. The problems have

been used successfully with an algebra class at Medford Mid-High School as well as with consumer math and geometry classes in other locations.

The above mentioned uses of the Vo-Tech problem sets are in no way meant to be all-inclusive. Their use seems to be limited only by one's resourcefulness and imagination. It must be realized that these problem sets are not a panacea. Before the problems are incorporated, they must be carefully evaluated and planned for by the instructor. These criteria met the problem sets can be a useful addition to a mathematics class whether it is being taught in a traditional or laboratory setting.

HANDS-ON ACTIVITIES

A mathematics class, be it of a vocational or traditional college preparatory nature can be enriched with hands-on activities. Hands-on activities are activities designed to illustrate an abstract mathematical concept with some kind of manipulative device. These devices might be as simple as the use of a meter stick to illustrate the metric system or as complex as a model of an airplane lighting system and a consideration of the geometry and trigonometry that went into its construction. (The lighting model was developed by Pat Ashby at Lane Community College.) Where ever possible, concrete activities relating to the mathematics topic being taught should be brought into the classroom. An old transmission can be used to illustrate inverse proportions as they relate to gears or students might be encouraged to do geometric constructions with a carpenter's square. The scope of these activities is limited only by one's resourcefulness. Their principle thrust should be to make students aware that mathematics goes beyond the classroom. Hopefully, they will help to make students and teachers aware of the mathematics around them.

ARTICULATION

The Oregon Vo-Tech Math Project has provided not only a large collection of problem sets but a realization of the need for articulation between vocational-technical instructors and math instructors. Asking your vo-tech instructors for input as to the mathematics needs of their students greatly improves relations between them and mathematics. Where such relations are not established, it often happens that a vo-tech program begins teaching its own mathematics class. As mathematics teachers, we must keep the teaching of mathematics with those who are trained to do so. But, we must also be sure that what we teach meets the needs of our clientel. One way of gaining such assurance is through communication.

APPENDIX F

Subproject funded by O.M.E.C.

A. Project Identity

1. The Oregon Vo-Tech Math Project

2. Project Number 23-5

3. The project was conducted on a statewide basis. It included conferences at each of the following locations:

   a. Inn of the Seventh Mountain -- Bend, Oregon (June 20,21)

   b. Linn-Benton Community College -- Albany, Oregon (Mid-Summer)

   c. Inn at Otter Crest -- Newport, Oregon (August 1,2)

   In addition, the participants worked in their own communities. The following schools were represented: Treasure Valley Community College, Ontario; Lane Community College, Eugene; Rogue Community College, Grants Pass; Linn-Benton Community College, Albany; Sprague High School, Salem; Medford High School, Medford; Dallas High School, Dallas; Canby High School, Canby; Washington High School, Portland; Benson High School, Portland; and Baker High School, Baker.

4. The project started June 20, 1974 and ended August 2, 1974. In addition a follow-up conference was held at Linn-Benton Community College on February 22, 1975.

5. Project Director:

   Dell L. Swearingen
   Linn-Benton Community College
   6500 SW Pacific Blvd
   Albany, OR 97321
   Phone: 928-2361 exts. 304, 330

B. Project Intentions:

1. The typical Vo-Tech student, at the high school level, is put in a general math class. These classes often consist of students with discipline problems, students uninterested in school, students who have mathematic deficiencies, and in general, these classes serve as a school dumping ground. Thus it is not very surprising to find that in many schools 50% of the students are flunking general math classes. The majority of these students end up in a Vo-Tech occupation. Thus, many of these students show up at the community colleges with deficient math backgrounds.

   Among the many groups that have expressed their disappointment with this situation are high school math instructors, parents, community college Vo-Tech math instructors, Vo-Tech instructors, and representatives from industry.

   It has been observed that many, if not most students involved in Vo-Tech or general math classes at the high school level have different modes of learning than the typical college bound students. One possible

solution to the problem seemed to be looking at manipulative devices for teaching mathematics. These devices would afford Vo-Tech students an opportunity for learning mathematics in ways other than the pencil and paper method. Science instructors have worked with activity kits for many years. Also, research at the elementary level seems to indicate that manipulative devices are a very effective teaching device. Manipulative devices afford the student the opportunity to go from the concrete to the abstract and then back to the concrete until he feels comfortable with the abstract. Thus, taking a lesson from elementary math and science instructors and also realizing that Vo-Tech students would often prefer working with their hands, we spent part of the summer investigating hands-on activities to help supplement the goals which will follow later in this report.

2. The project was focused on instructors from high schools and community colleges who had previously asked to be included in the Oregon Vo-Tech Math Project's summer project. Each participant was qualified to teach mathematics and had either a B.S. or M.S. in mathematics. The following is a list of the math instructors included in the project:

    1. Allen Claudsen -- Treasure Valley Community College
    2. Pat Ashby -- Lane Community College
    3. Gene Enfield -- Sprague High School
    4. Dennis Dedrick -- Medford High School
    5. Dick Holliday -- Rogue Community College
    6. Bob Kenyon -- Dallas High School
    7. Woody LeSueur -- Canby High School
    8. Gordon McEwen -- Washington High School
    9. Gordon Riese -- Benson High School
    10. Ed Wright -- Linn-Benton Community College
    11. Joan Miller -- Linn-Benton Community College
    12. Lynn Mitchell -- Baker High School
    13. Ted Boyll -- Treasure Valley Community College
    14. Elaine Wells -- Albany High School

Goals	Objectives	
1. To improve mathematics programs for students interested in pursuing a Vo-Tech career.	1.1 To bring the participants up to date on materials which have been previously developed by the Oregon Vo-Tech Math project.	1.1.1
	1.2 Examine possible instructional strategies which incorporate Vo-Tech oriented activities in the math classroom.	1.2.1
		1.2.2
		1.2.3
		1.2.4
	1.3 Establish a common format for documenting Vo-Tech oriented instructional activities.	1.3.1
		1.3.2

s programs
ed in pur-
r.

Objectives	Activities
1.1 To bring the participants up to date on materials which have been previously developed by the Oregon Vo-Tech Math project.	1.1.1 Dell Swearingen will give a progress report and history of the Oregon Vo-Tech Math project at the June 21-23 meeting.
1.2 Examine possible instructional strategies which incorporate Vo-Tech oriented activities in the math classroom.	1.2.1 Dr. Fitzgerald will discuss instructional strategies being investigated by the various research projects around the U.S.
	1.2.2 Ed Wright, who developed the PILLS System at LBCC, will discuss possible instructional strategies for using Vo-Tech activities in the math classroom.
	1.2.3 Break participants into 5 groups of 4 each. Have them rotate and work through Vo-Tech activities prepared by Harold Hauser, Ed Wright and Dick Holliday.
	1.2.4 Divide participants into two groups to brainstorm possible instructional strategies that would be feasible on various instructional levels-Algebra I, General Math, Consumer Math, Vo-Tech Math, etc.
1.3 Establish a common format for documenting Vo-Tech oriented instructional activities.	1.3.1 During the first meeting discuss what must be included in the documentation of an activity.
	1.3.2 Dell Swearingen and Ed Wright will meet with Greg Thomas to

Goals	Objectives	
		d f i w e
		1.3.3 D w s m
		1.3.4 R A
	1.4 Develop Vo-Tech-oriented activities.	1.4.1 D h a a
		1.4.2 D i g a
		1.4.3 A i t
		1.4.4 D p a c
		1.4.5 D t p t a

Objectives	Activities
	discuss a possible format for documenting Vo-Tech instructional activities which will facilitate evaluation.
	1.3.3 Dell Swearingen and Ed Wright will mail participants a suggested format for documenting the activities.
	1.3.4 Review the format during the Aug. 1-3 meeting.
1.4 Develop Vo-Tech-oriented activities.	1.4.1 During the June 22-23 meeting have instructors choose an area in which to develop activities.
	1.4.2 During the 6 weeks the instructors will research and gather material for the activities.
	1.4.3 At the August 1-3 meeting the instructors will demonstrate their activities.
	1.4.4 During the school year the participants will try the activities in their class or classes.
	1.4.5 During a future meeting of the Vo-Tech Math project participants will communicate their results of their Vo-Tech activities.

Goals	Objectives	
	1.5 The instructors will use Vo-Tech oriented activities in their classes during school year 1974-75.	1.5.1 T a t
		1.5.2 T a p
	1.6 To create pilot Vo-Tech Math classes to be offered in at least 5 Oregon high schools.	1.6.1 A p d a t m
		1.6.2 T w n i d
		1.6.3 S u c m c
		1.6.4 T t n t
		1.6.5 T t y
		1.6.6 T l c s

Objectives	Activities
1.5 The instructors will use Vo-Tech oriented activities in their classes during school year 1974-75.	1.5.1 The participants will keep a journal of their use of the Vo-Tech activities.
	1.5.2 The activities will be reviewed at a later Oregon Vo-Tech Math project meeting.
1.6 To create pilot Vo-Tech Math classes to be offered in at least 5 Oregon high schools.	1.6.1 A sub-group of the summer project participants will discuss possible content of a Vo-Tech Math class during the June 21-23 orientation meeting.
	1.6.2 The members of this sub-group will examine the Vo-Tech problem sets and possible instructional materials during the 6 weeks work period.
	1.6.3 Some participants will write up objectives and define curriculum for a pilot Vo-Tech mathematics course to be offered at their school.
	1.6.4 These participants will present this Vo-Tech math class to the rest of the participants at the August 1-3 meeting.
	1.6.5 These participants will offer this class during the school year 1974-75.
	1.6.6 These participants will keep a log on the Vo-Tech mathematics class developed during the summer project.

Goals	Objectives	
		1.6.7 T p t o p
2. Promote articulation between various levels of math education and within the project participant's school.	2.1 To promote articulation between high schools, community college and university mathematics instructors.	2.1.1 B c i p o
		2.1.2 H t p c
	2.2 To promote in-school communication.	2.2.1 P v i
		2.2.2 W p a c
		2.2.3 D w i t t c
3. To act as a catalyst to start mathematics instructors thinking about using Vo-Tech related materials as a resource in their teaching strategies for mathematics programs for students interested in pursuing a Vo-Tech career.	3.1 To improve relevency of math content in the mathematics classes for students interested in pursuing a Vo-Tech Career.	3.1.1 P m V c
		3.1.2 P c

	Objectives	Activities
		1.6.7 These participants will present their evaluation of the class at a future meeting of the Oregon Vo-Tech Math Project.
tween various n and within 's school.	2.1 To promote articulation between high schools, community college and university mathematics instructors.	2.1.1 Bring high school, community college and university instructors together as participants at a conference on June 21-23 and August 1-3.
		2.1.2 Have participants list visits that they have had with other project people at other schools during the six-week work period.
	2.2 To promote in-school communication.	2.2.1 Participants will make note of visits they have with vocational instructors in their school.
		2.2.2 Whenever possible have participants work with administration to establish objectives for program.
		2.2.3 Ed Wright and Dell Swearingen will write letters to administrators of participants to thank them for encouraging their staff to work on Vo-Tech-oriented materials.
start mathe- king about aterials as ching strate- ograms for pursuing a	3.1 To improve relevency of math content in the mathematics classes for students interested in pursuing a Vo-Tech Career.	3.1.1 Participants will include problem sets from the Oregon Vo-Tech project in their classes.
		3.1.2 Participants will design hands-on activities based upon

Goals	Objectives	
	3.2 Given Vo-Tech activities developed by other instructors or by themselves and by teaching an equivalent subject matter course, the participants will use the activities.	3.2.1
		3.2.2
		3.2.3
	3.3 Embed the Vo-Tech problem sets in the mathematics instruction for the students interested in pursuing a Vo-Tech career.	3.3.1
		3.3.2
		3.3.3
		3.3.4
		3.3.5

Objectives	Activities
	observed activities from vocational fields.
3.2 Given Vo-Tech activities developed by other instructors or by themselves and by teaching an equivalent subject matter course, the participants will use the activities.	3.2.1 Participants at the Aug. 1-3 meeting will examine other participants Vo-Tech activities.
	3.2.2 The participants will keep a log of the activities that they try.
	3.2.3 At a future Oregon Vo-Tech meeting participants will share their experiences with the Vo-Tech activities.
3.3 Embed the Vo-Tech problem sets in the mathematics instruction for the students interested in pursuing a Vo-Tech career.	3.3.1 Participants will be given evaluation sets of the Oregon Vo-Tech Math problems during the first meeting June 21-23.
	3.3.2 The instructors will be given a list of the complete problem sets by subject area and a copy of all the complete problem sets available by June 21.
	3.3.3 The participants will review the Vo-Tech problem sets during the six-week work shop.
	3.3.4 Participants will review Vo-Tech material as it becomes available.
	3.3.5 The participants will determine where the Vo-Tech problem sets can be used in their classes.

Goals

Objectives

3.3.6

Objectives	Activities
	3.3.6 The participants will indicate during the meeting August 1-3 how they will be using the problem sets.

C. Description of Project

1. The opening conference included the following orientation topics:

   a. History of the Vo-Tech Math Project.

   b. Available Vo-Tech Math Project booklets.

   c. Summary of other projects and resources throughout the United States.

   d. The presentation of possible instructional strategies.

   e. Demonstrations of hands-on activities developed for students use.

   f. Outlines of potential Vo-Tech math courses for high schools.

   The project participants digested the above presentations and then signed contracts (included in appendix) indicating what they would be responsible for during the summer.

   For the sake of brevity I will give just one example of the many hands-on activities which the participants were exposed to. We obtained an automobile transmission, unbolted the face plate and then cut the shafts off at about six inches each. Now we could motivate the math topic of ratio and proportion by having the students turn the shaft on one side and guess the gear ratio of the opposite shaft. Some students might mark both shafts to get a closer estimate. Next the students can count the teeth and calculate the gear ratios mathematically. Once the student can visualize what is happening mechanically, he can try some ratio and proportion problems of a more abstract nature. The same activity can be repeated in various gears. This problem allows the students the opportunity to work from the concrete to the abstract and then return to the concrete if necessary.

2. The project was staffed by:

   a. Dell Swearingen, B.S., M.S. in mathematics; Project director and speaker at many O.C.T.M. and N.C.T.M. Conferences. (Linn-Benton Community College)

   b. Ed Wright, B.S., M.S. in mathematics; Group leader and speaker at many O.C.T.M. and N.C.T.M. Conferences. (Linn-Benton Community College)

   c. Dr. Bill Fitzgerald, visiting professor in math education at the University of Oregon. Dr. Fitzgerald is a professor from Michigan State University. Dr. Fitzgerald served as a consultant.

   d. Dr. Bill Simons, Oregon State University; Dr. Simons has headed N.S.F. summer institutes at O.S.U. Dr. Simons served as a consultant.

   e. Dr. Bob Main, Oregon College of Education; Dr. Main served as a consultant.

There were six days of meetings held in all, three at the first of the project, one about mid-way, and a final two day meeting at the end of the project. Project members were contacted by phone between meetings. The project participants were encouraged to get together on an informational basis whenever possible.

Because of the large distances between participants cities, letters, telephone conversations, and the six meetings served as the major source of sharing information.

The participants received $1,000 for the summer project. In addition, the participants received some travel, meal, and room allowance while attending the meetings held at the Inn of the Seventh Mountain and the Inn at Otter Crest. (See Appendix)

College credit was not given -- the feeling was that if college credit was given the participants would do just enough to obtain whatever grade they were interested in. We would rather they gave 100 percent.

Money Spent

$12,950.00	Salaries
735.00	Travel and Meals at the Inn of the Seventh Mountain
450.19	Lodging at Inn of the Seventh Mountain
335.00	Meals and Travel at Inn of Otter Crest
397.25	Lodging at Inn of Otter Crest
43.75	Lunch at Linn-Benton Community College
$14,911.19	TOTALS

In addition, Woody LeSueur's school district paid his salary. Gene Enfield's and Allan Claudson's schools paid $500 on their salaries. Also the State Department of Education provided the funds to print the activity booklets.

No special materials were used other than those already mentioned in this report. The only special instructional procedures employed were outlined above. The project goals and objectives remained constant throughout the project.

B. Project Accomplishments:

The contracts which are listed in the Appendix indicate the types of materials which were produced by the project participants. For the most part, these materials were either hands-on activities to be used in the mathematics classroom, or a course syllabus of a potential Vo-Tech mathematics course. Each instructor dittoed copies of his(her) materials to be shared with the other participants. The participants felt that some type of booklet should be constructed to summarize the activities produced by the project. These materials had not been classroom tested at the time the booklet was assembled. The booklet contains some printing errors, but will provide the reader with some idea of the types of activities that the project participants were engaged in. (A copy will accompany the report).

The objectives were written with accompanying activities. We felt that if these activities were accomplished, the objectives would have been completed. The only activities which were not completed were due to the

administrative structure of the high schools. As of yet there are still participants who were not able to implement their Vo-Tech courses and activities at the high school level. Although this is somewhat discouraging one must realize that it often takes many years to implement change at the high school level.

The follow-up meeting at L.B.C.C. served as a summary and evaluation session. The participants were very positive about the articulation which had taken place and the ideas they had generated during the course of the project.

The only residual effects of the project consisted of the information which was passed on at the individual's schools and at local O.C.T.M. conferences where we were asked to speak. Dr. Bob Main developed a slide show describing the project and some of its activities. The slide show was very well received at the Klamath Falls O.C.T.M. Conference this past October.

I cannot think of any undesirable effects of the project except anytime money is handed out there will always be one participant that is involved mainly for the money.

The identified problem is a very complex problem -- it will never be eliminated -- but we were able to go back to the classrooms with many fresh ideas to try in the fall.

APPENDIX

Pat Ashby, Lane Community College:
Collect problems from the Airframe Mechanics program at Lane Community College. Develop hands-on activity packages related to Mth. 4.200 series and Airframe Mechanics.

Mr. Allan Claudson, Treasure Valley Community College:
Will set up a Mth. 1622 (Mth. 4.200) class compatible with the Vo-Tech problem sets. Develop hands-on activity packages related to the above class.

Mr. Dennis Dedrick, Medford Mid-High School:
Write a potential Vo-Tech Math Course for 9th or 10th grades. This course will incorporate the Vo-Tech Math materials. Develop hands-on activity packages related to the above class.

Mr. Gene Enfield, Sprague High School:
Given the Oregon Vo-Tech Math materials, you will pick at least two career areas and develop a slide presentation for these career areas. You will also develop a pilot vocational tech course to be offered at Sprague High School this fall.

Mr. Dick Holliday, Rogue Community College:
Will develop hands-on activity kits as related to the welding program. Create a sample kit for instructors.

Mr. Bob Kenyon, Dallas High School:
Examine the Plane Geometry Course with respect to minimum requirements. Incorporate within this class hands-on activities utilizing the Vo-Tech materials.

Mr. Woody LeSueur, Canby High School:
Develop a pilot Vo-Tech math course to be offered at Canby High School this fall. Create hands-on activities utilizing the Vo-Tech materials for this course.

Mr. Gordon McEwen, Washington High School:
Collect problems from the field of Real Estate. Develop hands-on activities for Algebra I utilizing some of these problems.

Mr. Lynn L. Mitchell, Baker High School:
Create the following activity packages:
1) Unit pricing
2) Auto insurance
3) Interest, borrowing and investment

Mr. Gordon Riese, Benson High School:
Will develop hands-on activity packages for the automotive math student to include a basic vocabulary list of automotive terms.

Ms. Elaine Wells, West Albany High School:
Given the Oregon Vo-Tech problem sets, you will create instructional activities for the general math class that will integrate with various outside subject areas, for example, home economics and occupation classes.

Mrs. Joan Miller, Linn-Benton Community College:
Create hands-on activities for the Mth. 4.200 series at Linn-Benton Community College.

Mr. Edward B. Wright, Linn-Benton Community College:
Will create hands-on activities for the pre-tech math course at L.B.C.C. utilizing the Vo-Tech materials.

Participants

		Salary	Travel and Meals
Allan Claudson	(matched by school)	500.00	60.00
Pat Ashby		1,000.00	60.00
Gene Enfield	(matched by school)	500.00	60.00
Dennis Dedrick		1,000.00	60.00
Bill Fitzgerald		150.00	20.00
Harold Hauser		-0-	20.00
Dick Holliday		1,000.00	60.00
Bob Kenyon		1,000.00	60.00
Woody LeSueur	(school paid full 1,000)	-0-	60.00
Gordon McEwen		1,000.00	60.00
Bob Main		50.00	60.00
Joan Miller		1,000.00	60.00
Lynn Mitchell		1,000.00	60.00
Leif Ostmo		-0-	20.00
Bill Simons		50.00	60.00
Dell Swearingen		-0-	60.00
Darrel Tucker		-0-	20.00
Ed Wright		1,500.00	90.00
Ted Boyll		1,200.00	-0-
Gordon Riese		1,000.00	60.00
Elaine Wells		1,000.00	60.00
		12,950.00	1,070.00

Total = $ 14,020.00

CONFERENCE
June 20-22
Inn of the Seventh Mountain
Bend Oregon 97701

AGENDA

Thursday, June 20

6:30 PM	Dinner at the Red Toe Restaurant
7:30 PM	Opening Remarks, Ed Wright, Linn-Benton Community College History, Dell Swearingen, Linn-Benton Community College Address on classroom instruction, Dr. Bill Fitzgerald, University of Oregon

Note: Dr. Fitzgerald is a visiting professor from Michigan State University. He will be at the meeting as a consultant all day Friday.

Friday, June 21

8:00 AM	Breakfast
9:00 AM	Instruction Strategies Dick Holiday, Rogue Community College Harold Hauser, Blue Mountain Community College Ed Wright, Linn-Benton Community College
10:30 AM	Coffee Break
10:45 AM	Discuss in Small groups-possible use of problem situation in math instruction
12:30 PM	Lunch
2:00 PM	Write Contracts
3:00 PM	High School vocational mathematics content discussion
6:00 PM	Dinner
7:00 PM	Discuss format of developed material and documentation

Saturday, June 22

8:00 AM	Breakfast
9:00 AM	Presentation of Proposals by Members. Each member will present his plan of development. Everyone will receive a copy of topics to be developed.

Note: Please bring curriculum material and texts used in mathematics classes. We will hold an open discussion session centered around this material.

CONFERENCE
August 1,2,3
Inn at Otter Crest
Otter Rock, Oregon

A G E N D A

Thursday, August 1

6:30 PM	Dinner at Flying Dutchman
8:00 PM	Each participant will summarize his(her) activities for the last six weeks

Friday, August 2

9:00 - 11:30 AM	Participants will become familiar with each others materials and hands-on activities
1:30 PM	Discuss pilot Vo-Tech Math classes which were developed for high schools
4:00 PM	Volleyball
8:00 PM	Discuss use of activity packages in relation to course work

Saturday, August 3

9:00 - 11:30 AM	Summary

Note: All meetings will be held in the Conference Room.
All activity packages can be brought to the Conference Room Thursday evening and left there.

February 17, 1975

Dear Colleagues:

The inspiration of a brain-storming session at Linn-Benton Community College, Saturday, February 22, 1975, has received wide endorsement. The session will commence at 9:00 a.m. in room ST-119 of the Science/Technology Building. The purpose of this letter to encompass the following information:

1) Confirmation of the meeting

2) An agenda

3) A map of Linn-Benton Community College

Agenda:

1)	9:00 - 9:30	Vertical articulation over coffee & donuts
2)	9:30 - 10:00	Introductions - slide presentation of last summer's activities
3)	10:00 - 12:00	Participants will bring and demonstrate (involving the group) their best classroom-tested hands-on activities
4)	12:00 - 1:00	Lunch at LBCC
5)	1:00 - 3:00	Divide into small groups by interest area

Small Groups:

a) Vo-Tech Math Course for high school students

b) Vo-Tech Problem Sets and their uses

c) Hands-on projects

d) Programmable calculators for technical math students

Note:

The small group titles are only suggestions. It is the hope of the project director that participants will be involved in discussion of each of the aforementioned topics which appeal to their interest.

6) 3:00 - 3:30 Group reports and summarization (evaluation)

7) Adjournment

Thanks for your interest,

Dell Swearingen